LABORATORY WORK FOR THE BLIND

Robert T. Hance

HV1649
H

M.C. MIGEL LIBRARY
AMERICAN PRINTING
HOUSE FOR THE BLIND

C.1

v.1 - No.4 - Dec. 1935

Laboratory Work for the Blind

● **By Robert T. Hance, M.A., Ph.D.,** *(University of Pennsylvania)*
PROFESSOR OF BIOLOGY, UNIVERSITY OF PITTSBURGH

HV1649
H
copy 1

The need for eyes in laboratory study has seemed so obvious that we have frequently either waived or modified the graduation requirement of a laboratory science for those students without the normal powers of vision. An increasing number of blind students, well endowed mentally, are beginning to feel the need for training of the sort afforded by the college. Laboratory work has usually been assumed to be one phase of a college course that a blind student could not master. Chemistry as it is usually given is certainly not practical. On the other hand, being without sight has as a rule focused the attention of the blind on their own biological functions, and it has seemed a pity not to give them the advantages of our modern knowledge and to give this as it can only be done in the laboratory—through personal contact.

Laboratory work in biology for blind students? Impossible? To the average teacher the problem would be baffling. Not so to Dr. Hance.

Read what clever pioneering work is being done by an outstanding teacher in the biological field.

To carry a blind student through a course in biology is not an entirely new venture, as it has been done in other colleges with the aid of stock models of animals and plants and with plastocene modeling clay shaped to simulate structures not available in the models. Few laboratories have a very complete collection of models and, at the best, plastocene is a messy and temporary medium. In casting about for a material free of these difficulties and that would permit the rapid outlining of anatomical parts, the possibilities of soft wire presented themselves. Wire solder is about one eighth of an inch thick and very flexible. Soft aluminum wire comes in various thicknesses and can be used to differentiate smaller structures. In the beginning of our use of this wire we made a number of circles and rods of various sizes. Our "drawings" were then built up "tinkertoy" fashion with the proper combinations of circles and rods. It is interesting to discover how many variations of structure can be produced with a comparatively few changes in the arrangements of these rings and rods. These were not too satisfactory as the student could readily disarrange the parts as he felt them.

We then developed much more exact drawings in wire and cemented them to stiff card board with liquid solder. The parts are labelled in Braille which does away with much of the close supervision that the instructor thought was originally called for. The Braille labels are connected to the respective parts by a wire equivalent of the dotted line. Fine soft aluminum wire is wound tightly cork screw fashion about a thin mandrill like a heavy needle. This spiral is then pulled out to considerable length making it appear like a wavy line and feel like a series of dots as the finger passes over it. There are no other wires of this character on the chart; so the student knows when his fingers contact these spirals that they lead from organ or part to label. The accuracy as well as the artistic success of our collection of wire drawings is due to the skill of Miss Velva Seyler, a senior student in the department.

Our blind students attend lectures which they are as capable of taking down in Braille as is the seeing student by the more common methods. The text book is read to them, sometimes by kindly disposed students or by readers provided by various societies or clubs. They, of course, have no difficulty in taking part in the discussions that are held each week between the instructor and small groups. Now with these outline drawings done in wire and labelled in Braille, the writing of the blind, they have a chance to correlate the various materials that have been presented to them. Animals such as the Echinoderms, Arthropods and many vertebrates firm enough to be handled need no substitutes. It was surprising to me that after having been guided through the dissection of a frog they have been able to repeat the dissection and to identify parts as small as the pancreas. Moreover their dissections were carried out on four-inch frogs.

Examinations, of the "fill in" or "true or false" types, are read to them and filled in by the instructor as they dictate. Essay examinations are written out on their typewriters. In our experience our blind students, taking the same examinations as the regular students, pass them as a rule with B or even A grades.

It is natural that these students should take a little more of the instructor's time than those with normal vision, but their interest, the worth-whileness of the effort and their very sincere appreciation seem to justify the time required.

Mendelism, which was anticipated as a real stumbling block, proved easiest of all. Hereditary traits were represented as long and short rods and large and small circles. The larger figure was indicated as dominant to the smaller. In the dihybrid cross involving two characters a Punnett square was made of 16 small boxes to hold the genes representing the zygotic combinations. Four small boxes were fastened both across the top and down the side of the square. These small boxes contained the gametic or germ cell possibilities in long rods and circles, and the combinations resulting from the union of any two germ cells could be checked

Continued on Page Thirty-four

Translating Science Into News

● **By Frank Thone, Ph.D.,** *(University of Chicago)*
LECTURER AND WRITER, SCIENCE SERVICE, WASHINGTON, D. C.

"The gospel of science should properly be preached by those who are writing it, who know its truths most intimately, and feel their significance most strongly . . . The people are ready to have the gospel preached to them . . . But most scientists remain ingloriously mute."

Dr. Thone is a scientist who both practices and preaches. He knows how to write. In this article he gives practical hints about preparing stories of scientific interest for the press. Perhaps there is a story in your laboratory or classroom.

●

Human social groups function best when they move unitedly like armies on the march. If the leaders, the advance guard, fail or neglect to maintain touch with the slower-moving main body, it is bad for all concerned. The leaders, perhaps glancing back from a height far out in front, may be dismayed to see that their army has fallen into disarray through lack of the information they should have been constantly sending back; or worse, interloping false leaders may have seized the opportunity to trick them down the wrong road toward ruin.

Time after time, in the long tragedy of human history, this has happened. The best minds of the people, eagerly pursuing some great good which they see clearly enough, have isolated themselves. Sometimes they have forgotten how to pass back to the main body the gist of the knowledge they have gained; sometimes they have fallen into the sin against their brothers, of thinking them incapable of understanding the message if they did send it.

And time after time the result has been the same. Without vision, the people perished, either floundering helplessly for want of counsel, or duped by heretics in religion, demagogues in statecraft, knaves in economics, charlatans in science.

When reformers have risen to set things right again, their first care has been to reëstablish contact with the people. It is not without significance that the great restorers of religion (Francis, Dominic, Bernard, Albert—to name only a random few) were not only themselves notable preachers, but were also most active in inspiring good preaching by the whole clergy, whether in their own orders or in ordinary, dusty, parochial jobs.

In so doing, they were following the most august of examples. Christ, concluding the swift catalogue of his works to convince the inquiring disciples of John the Baptist, came to a climax with "and the poor have the gospel preached to them." It was well enough to heal the blind, the deaf, the halt; but most important to put men into possession of those truths that could enable them to achieve for themselves spiritual sight, hearing, wholeness.

As with matters of the spirit, so also with things more mundane, of our own day. Modern natural science has made it possible to accomplish remedies of evil and promotions of good by entirely natural means, that were once beyond the reach of aught except the miraculous. At least some of the blind see, and some of the lame walk again; in our own day lepers are being cleansed; but despite the thousands of ardent disciples that science can boast, the poor, the uninstructed, hear the gospel of science from only a few tongues—and even among these, some have rather dubious claim to a license to preach.

This unfortunate state of affairs has perhaps at least a partial explanation in the history of natural science itself. Science has claimed its present large share in our common life so very recently that it has as yet hardly had time to get its activities well organized. Not that science is a new thing; its origins go back to a very respectable antiquity, as any textbook's opening chapter will tell you. But it had such an unconscionably long infancy. While other departments of human endeavor—religion, statecraft, the fine arts, even war—went through their development at a more or less even rate through many centuries, science lagged behind in an almost embryonic state—and then in two or three brief human generations spurted ahead to catch up with its brethren, and has even begun to boss the rest of the family around!

It is understandable, therefore, that the work of informing the people about at least the basic facts and significances of science has not yet been well performed. But it is no longer excusable—the less so, since further neglect becomes increasingly dangerous, with self-interested misinterpreters of the stripe of Nietzsche, Haeckel, Marx and Goebbels daily preaching distortions of science in support of their own distortions of philosophy.

The gospel of science should properly be preached by those who are writing it, who know its truths most intimately and feel their significance most strongly, because they themselves have wrought in their discovery. To some extent this has long been done. Charles Darwin's books, heavy though their style seems to us now, were "popular" in their day, for mid-Victorian literary digestions were tougher than ours. Louis Pasteur could not only lecture convincingly before a lay audience but he could also stage a scientific demonstration that could impress even a crowd of mixed farmers,

Continued on Page Twenty-nine

You Should Read

Continued from Page Twenty-one

ner of its presentation provoke the thought that the authors have had much experience in teaching the sciences to high school girls and boys.

Sister M. Cornelia, O.S.B.,
Immaculate Conception High School,
Connellsville, Pa.

The First Year of Chemistry

- *By* JOHN C. HESSLER, PH.D., Professor of Chemistry at Knox College; Chicago; Benjamin H. Sanborn & Co., 1934. xii + 560. $1.68.

Workbook Manual of the First Year of Chemistry

- *By* JOHN C. HESSLER; Chicago; Benjamin H. Sanborn & Co., 1934. vi + 330.

Most secondary science books, written from the modern view-point, show a decided shift in content and method. The new approach is strongly psychological; the old logical. Chemistry texts, for the most part, remain static. Authors in this science have done least to emphasize practical applications to the betterment of human life. Among recent publications *The First Year of Chemistry* has certain features which mark an improvement in secondary science texts, although there is nothing revolutionary in its exposition. Of special learning value are the descriptive illustrations, for they are designed to clarify and correlate facts in the text. The pronunciation of scientific terms as they occur is good motivation for vocabulary difficulties. Fortunately the self-testing exercises on each chapter measure the pupil's interpretative and generalizing power.

In his selection of factual material, Dr. Hessler follows the traditional school. Items in the table of contents of this recent book are almost identical with those published thirty to fifty years ago; yet the author includes all the recent theories and new processes and up-to-date findings on the elements and the structure of matter. To write understandingly of such subjects, a man must possess knowledge and experience. Dr. Hessler, a recognized scientist, has both. Still one regrets that he makes no direct attempt at unitary organization of material that emphasizes chemistry's relation to man. Units, centered about elements necessary for life, the relation of chemistry to human health and society, chemistry's contribution to the home, or industrial chemistry, if developed, would provide a background for further study of chemistry. Such stuff needs emphasis.

As this title suggests, the work is not intended as an exhaustive treatise of chemistry. Neither does the author romanticize chemical theory. Rather Dr. Hessler gives a clear, concise exposition of basic scientific principles, arranged in compact form. The style is simple. Although the type selected and its spacing is a little confusing, the physical make-up of the book is good. Dr. Hessler's book comes at a time when there is need of change in the organization of chemistry. It deserves consideration.

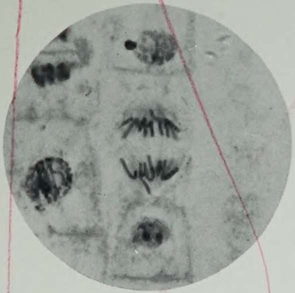
The companion workbook manual marks Dr. Hessler's chief departure from the conventional course. It is excellent. It avoids the extremes of over mechanization; and, at the same time, the plan provides sufficient graphic material, practical laboratory directions, and time-saving devices to make the workbook of value to both teacher and pupil.

M. G. I.

On the Subject of—

MITOSIS

●



MODELS

M1935	Eight models on individual stands, completely colored	$29.50
M1935a	Eight models on plaque, completely colored	17.50
M1936	Eight models on plaque, no differential coloring	12.75

LANTERN SLIDES

BL19	Thirteen photomicrographic slides on mitotic stages in onion root tip with explanatory leaflet	8 75

CHARTS

SS1	Schmeil. Mitosis and Cell Structure	8.85
SD2	Smalian-Dobers. Mitosis and Reduction Division	7.00

MICROSCOPE SLIDES

B951	Stages in l. s. of onion root tip	.70
B953	Stages in l. s. of hyacinth root tip	.70

NEW YORK SCIENTIFIC SUPPLY CO.
(Formerly N. Y. Biological Supply Co.)
Laboratory Supplies for Biology and Chemistry
111-113 EAST 22ND STREET, NEW YORK, N. Y.

Laboratory Work for the Blind

Continued from Page Four

by feeling the contents of the appropriate zygotic box in the square. Interestingly enough these models seem helpful in aiding the normal student to visualize the Mendelian processes.

The amount of biological information and its interpretation and correlation with other fields of knowledge gained and made by the blind students during two semesters of study involving lectures, discussions, readings and the laboratory work with the wire "drawings" and with actual specimens, seems to be fully as great as that acquired by superior college students who are without the visual handicap.

The Sound Film

Continued from Page Thirteen

CONCLUSIONS

Factual Questions

1. For the non-chemistry groups the results in factual learning seem to indicate that sound film can teach quickly and effectively.

2. For this particular topic and film it would seem that the non-chemistry groups acquired more from the film than the chemistry groups.

3. For the chemistry groups the results in factual learning seem best when presented by the lecture-film-recitation-film method. Comparison of all chemistry film groups with all chemistry non-film groups seems to indicate that for this topic the results in factual learning are slightly better when taught with the aid of sound film. Of course sound film can teach much larger groups and much less expensively.

4. The sound film undoubtedly enriches teaching by showing certain experiments, apparatus, commercial plants, commercial processes and scientific materials that could not be presented to or viewed by the average class in chemistry by any other means. Also it is to be expected that chemistry classes will be certain by means of good sound films to see and hear expert lecturers and technicians in action. Of course the sound film cannot teach manual skills or attain the many objectives that are possible only through close association and contact with teacher, apparatus, and chemicals.

Interest Questions

1. The film seemed to awaken more interest in the non-chemistry groups than in the chemistry groups.

2. The chemistry film groups seemed to retain more interest in questions related to the film than the chemistry non-film groups. It would seem that the film showings helped retain interest in related topics.

3. Interest in topics not related to the film did not seem to be enhanced by the film showings.

BIBLIOGRAPHY

Arnspiger, V. C. *Measuring the Effectiveness of Sound Pictures as Teaching Aids*, New York: Bureau of Publications, Teacher's College, Columbia University, 1933.

Boucher, Chauncey S. "Talking Pictures in the University of Chicago's New Educational Plan", *Education*, February, 1933.

Devereux, F. L., and others. *The Educational Talking Picture.* Chicago: University of Chicago Press, 1933.

Koon, Cline M. *Motion Pictures in Education in the United States.* Chicago: University of Chicago Press, 1934.

Rulon, P. J. *Sound Motion Pictures in Science Teaching.* Cambridge, Mass.: Harvard University Press, 1933.

Watkins, R. K. "Learning Value of Some Motion Pictures in High School Physics and General Science", *Educational Screen*, May, 1931.

Wood, Ben D., and Freeman, Frank N. *Motion Pictures in the Classroom.* Boston: Houghton Mifflin Co., 1929.

Wyman, Carl E. "Visual Aids—Of What Worth?" *Science Education*, April, 1932.

Booklets

Instructional Talking Pictures, Erpi Picture Consultants, Inc., 250 West 57th St., New York, N. Y. List of science films made by University of Chicago.

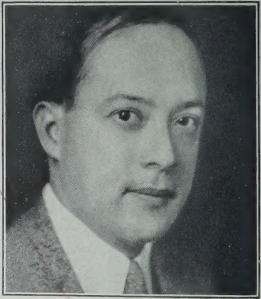
Schlesinger, H. I., and Lemon, H. B. *Oxidation and Reduction.* Chicago: University of Chicago Press, 1933.

Study guide for use with the educational sound picture of that name.

NEW WORLD OF CHEMISTRY

By BERNARD JAFFE

In this modern text the organization and choice of subject matter makes clear to the student that chemistry is a living and growing science by showing how discoveries lead to further research and thus to other discoveries. In this way the student's interest is aroused and held by the fascinating story of man's attempt to understand the nature of matter and the changes which matter undergoes. By this procedure the factual material required by the American Board, the New York State Regents, and representative courses of study throughout the United States takes on a new coherence and unity.



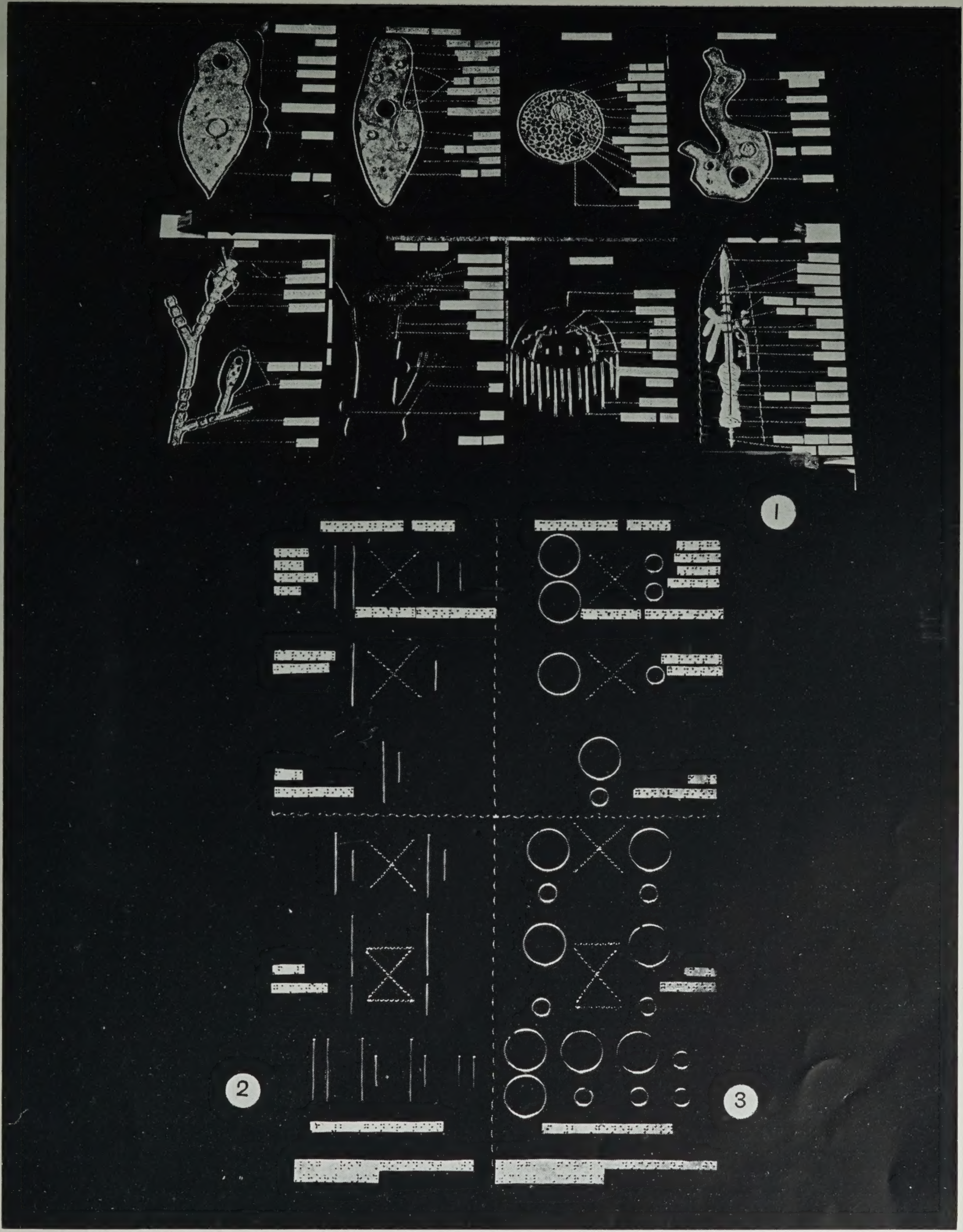
BERNARD JAFFE

Head of the Department of Physical Science, Bushwick High School, New York City.

Fiftieth Anniversary
SILVER BURDETT
1885 1935

Write to our nearest office for complete information.

SILVER, BURDETT AND COMPANY
NEW YORK - NEWARK - BOSTON - CHICAGO - SAN FRANCISCO



"DRAWINGS" IN WIRE, LABELED IN BRAILLE

1. TOP ROW, *left to right: Euglena, Paramoecium, Typical Cell, Amoeba.* BOTTOM ROW: *Obelia, Hydra, Medusa, Anterior End of an Earthworm.*

2 and 3. Wire diagrams used to demonstrate the laws of Mendel. Long rod is dominant to short rod and large circle is dominant to small circle.

Modern Chemical Warfare

• **By Gerald C. MacDonald, B.Ch.E.**
DEPARTMENT OF CHEMISTRY, ST. FRANCIS COLLEGE, BROOKLYN

How gullible is the public?

What is the truth about chemical warfare? Can New York City be destroyed in a few minutes by poison gas? Will bacteria be used as an offensive weapon in future wars?

Professor MacDonald answers these and many other questions.

As a commissioned officer in the Chemical Warfare Service of the United States Army he has contact with the best sources of information. His ideas will interest you.

●

Wars and threats of wars in Europe and Asia and Africa, regrettable as they are, cause much speculation as to what nature the fighting may assume. Because of the wide contacts which our high school teachers must maintain, it is imperative that they be properly equipped to discuss intelligently the modern developments in chemical warfare. The erroneous declarations of popular writers imbued with spectacular notions about gas warfare and the tendency of the press to exaggerate its sensational features make this requirement for our teachers all the more necessary, since our great non-scientific group has no other convenient means for obtaining information.

Popular Writings

Horror appears to be the theme of current articles on the use of chemicals in war, and the pity of this is that the reading public is very likely to accept the most sensational statements as though they were based on undisputed facts and announced by outstanding authorities.

Paul D. Gesner in *Forum*, October, 1931, presents a vivid picture: "Life does not exist in New York City today. Its millions of inhabitants lie dead—their lungs burned away by diphenylchlorarsine dropped from coalition planes in the air raid." In the quiet of his study Mr. Gesner evidently has discovered most remarkable properties for diphenylchlorarsine, properties which were unknown yesterday, and probably today, to anyone in the chemical profession. What the public does not know is that instead of being imbued with a spirit of horror when reading such material, it should find itself laughing. Diphenylchlorarsine, $(C_6H_5)_2AsCl$ is the old German agent, Blue Cross, so-called because the shells containing it were so marked for identification. It was used, not at all successfully, as a "sneeze gas," the theory being that, when used, it would not be adsorbed by the carbon in the canister of the gas masks, since it was a smoke of relatively large particle size. The theoretical result of the use of the gas was to be the removal of the mask because of intense nasal irritation, whereupon a lethal gas which had been disseminated concurrently would become effective. The lack of success in its use was due to the fact that because of the large particle size it did not penetrate the masks as well as was expected; further, the introduction of a filter pad into the canister effectively combatted its use.

Vedder, in *The Medical Aspects of Chemical Warfare*, states, "It is highly improbable that death will be caused by the use of these materials under field conditions." But such indisputable facts do not disturb our current writers; in the same month of the same year Emil Ludwig writing for the *Saturday Evening Post* stated, "If a certain kind of diphenyl chloral arsenic is mixed with air in the proportions of 1 to 10,000,000 its victim is compelled to throw off his gas mask, whereupon a deadly follow-up gas chokes him. People will be surprised in their sleep, and when they try to rise and reach for some support, they will begin vomiting and will fall unconscious, finally dying in convulsions." A minor detail overlooked by the eminent biographer was the fact that the American gas mask affords complete protection against diphenylchlorarsine. Had he been acquainted with fact, he might have made the statement that without some months of warning, and assuming that sufficient concentration could be attained, almost any lethal agent by itself would be effective in America, since money has never been appropriated by Congress to equip completely even our regular army—to say nothing of the civilian population—with gas defense equipment.

Again in the same discussion, the writer states that if an airplane dropped two large bombs of Lewisite gas over Chicago or Berlin, the populace in these cities would be wiped out. As a humorous sidelight we might calculate the size of the bomb required for partial completion of this tactical enterprise. Inadvertently, of course only inadvertently, the author neglected to do this. In order to neutralize an area of 10,000 square yards under average conditions, about 200 pounds of Lewisite is required. The area of the city of Chicago is 209 square miles or 647,398,400 square yards. The large bombs of which Mr. Ludwig speaks must each contain 32,370 pounds of Lewisite! And even if two such bombs could be carried by a plane, how the charge could possibly be disseminated over 209 square miles of area is gracefully left to the imagination. The chemical bomb in general use at present is the thirty-pound type.

The writer recently demonstrated the deadly effect of one of the popular agents of the fiction writer. At the close of one of his lectures, he supplied the hall with a copious quantity of gas, plus a dilution of tear gas, to make the lecture more "emotional." He has yet to hear of any casualties.

Bro-Dart INDUSTRIES
Newark, 8, N. J. • Los Angeles 25, Calif.
Toronto 6, Ontario
Made in U.S.A.